

WHAT IS CLAIMED IS:

1. A method for manufacturing a long resin molding having an axial bend, comprising:

supplying a resin molding material in heated and molten state extruded from an extrusion die to a sizing flow channel of a sizing equipment;

solidifying the resin molding material by cooling from outside within the sizing flow channel to calibrate the resin molding into a predetermined cross sectional shape;

extruding the resin molding of the predetermined cross sectional shape from an exhaust port of the sizing flow channel at a constant extrusion direction and a constant angle carriage and in a state capable of plastic deformation;

supplying continuously the resin molding to a molding gripping portion of a bender disposed on the downstream side of an exhaust port of the sizing equipment, the gripping portion slidably gripping the resin molding; and

performing an axial bending process for the resin molding when the resin molding passes through the gripping portion by disposing the gripping portion at a position so as to orient in a direction crossing the constant extrusion direction.

2. The manufacturing method according to claim 1,

wherein the step of performing the axial bending process includes performing the axial bending process while keeping

a part of the resin molding to be processed in a condition where the temperature of the inside is higher than the temperature on the outer surface of the resin molding.

5 3. The manufacturing method according to claim 2,
 wherein the keeping step includes keeping the part of
the resin molding to be processed in a condition where the
temperature on the outer surface is lower than the heat
distortion temperature of the resin molding material composing
10 the resin molding, and keeping the temperature of the inside
of the part of the resin molding higher than or equal to the
heat distortion temperature of the resin molding material and
lower than the melting temperature.

15 4. The manufacturing method according to claim 1,
 wherein the step of performing the axial bending process
includes performing a bending process for one part of the resin
molding in the longitudinal direction of the axial line at a
different radius of curvature from the other part by changing
20 the position of the gripping portion in accordance with a length
of the resin molding passing through the gripping portion.

5. The manufacturing method according to claim 1, further
comprising: applying a force on the resin molding in the same
25 direction as the extrusion direction on the downstream side

of the exhaust port of the sizing equipment and the upstream side of the gripping portion to cause the force to act as a pulling force of the resin molding from the sizing flow channel and a pushing force of the resin molding to the gripping portion.

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6. The manufacturing method according to claim 1, further comprising compulsorily cooling the resin molding from the outer surface with a coolant at least after the middle of the bending processing.

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7. The manufacturing method according to claim 1, the solidifying step includes cooling the resin molding material from the outer surface within the sizing flow channel so that the outer surface of the resin molding has a lower degree of
15 crystallinity than the inside, the resin molding material being a material containing crystalline resin as the main component.

8. The manufacturing method according to claim 1, further comprising detecting an extrusion length of the resin molding,
20 and cutting off the resin molding after the bending processing on the downstream side of the gripping portion, when the extrusion length reaches a predetermined length.

9. The manufacturing method according to claim 1, wherein
25 the gripping portion performs at least two of the following

operations,

(a) changing the position in a first direction crossing the extrusion direction,

(b) changing the position in a second direction crossing at right angle to the first direction, and

(c) changing the angle carrier.

10. A method for manufacturing a long resin molding having an axial twist, comprising:

10 supplying a resin molding material in heated and molten state extruded from an extrusion die to a sizing flow channel of a sizing equipment;

solidifying the resin molding material by cooling from outside within the sizing flow channel to calibrate a resin molding into a predetermined cross sectional shape;

15 extruding the resin molding of the predetermined cross sectional shape from an exhaust port of the sizing flow channel at a constant extrusion direction and a constant angle carriage and in a state capable of plastic deformation;

20 supplying continuously the resin molding to a molding gripping portion of a bender disposed on the downstream side of an exhaust port of the sizing equipment, the gripping portion slidably gripping the resin molding; and

performing an axial twisting process for the resin molding when the resin molding passes through the gripping portion by

disposing the gripping portion in a carriage different from the constant angle carriage.

11. An apparatus for manufacturing a long resin molding having

5 at least one of an axial bend and an axial twist, comprising:

an extrusion die having heating means for heating a resin molding material and an orifice for extruding the molding material into a predetermined cross sectional shape;

10 a sizing equipment having a sizing flow channel, connected to the extrusion die, for cooling from the outer surface and solidifying the resin molding material in heated and molten state extruded from the die to calibrate a resin molding into a predetermined cross sectional shape, and extruding the resin molding from an exhaust port at a constant extrusion direction
15 and a constant angle carriage, and a cooling unit for cooling the sizing flow channel;

a bender having a gripping portion, which is disposed on the downstream side of the sizing equipment, for slidably gripping the resin molding supplied continuously from the sizing
20 equipment; and

a driving mechanism connected to the gripping portion;

wherein the driving mechanism is capable of changing at least one of an orientation and an angle carriage of the gripping portion so as to be different than the constant extrusion
25 direction and the constant angle carriage.

12. The manufacturing apparatus according to claim 11,
further comprising: a pulling machine for applying a force on
the resin molding in the same direction as the extrusion
5 direction to cause the force to act as a pulling force of the
resin molding from the sizing flow channel and a pushing force
of the resin molding to the gripping portion;

wherein the pulling machine is disposed on the downstream
position of the exhaust port of the sizing equipment and the
10 upstream position of the gripping portion.

13. The manufacturing apparatus according to claim 11,
further comprising: a length detector for detecting an extrusion
length of the resin molding;

15 wherein the length detector is disposed on the downstream
position of the exhaust port of the sizing flow channel; and

an operation of the driving mechanism is controlled in
accordance with a signal from the length detector.

20 14. The manufacturing apparatus according to claim 13,
further comprising: a pulling machine for applying a force on
the resin molding in the same direction as the extrusion
direction to cause the force to act as a pulling force of the
resin molding from the sizing flow channel and a pushing force
25 of the resin molding to the gripping portion;

wherein the pulling machine is disposed on the downstream position of the exhaust port of the sizing equipment and the upstream position of the gripping portion; and

the length detector is connected to the pulling machine
5 so that the operation of the driving mechanism is controlled in accordance with a pulled out length detected by the detector.

15. The manufacturing apparatus according to claim 11, further comprising: a coolant supply device that supplies a
10 coolant for compulsorily cooling the resin molding extruded through the exhaust port from the outer surface;

wherein the resin molding is disposed on the downstream side of the exhaust port of the sizing flow channel.

15 16. The manufacturing apparatus according to claim 11, further comprising: a cutting-off machine for cutting off the resin molding into a predetermined length;

wherein the cutting-off machine is provided on the downstream side of the gripping portion.

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17. A method for manufacturing a long molding having an axial bend along a longitudinal direction, comprising:

forming a long first member capable of plastic deformation continuously in the longitudinal direction, by employing a first
25 member molding unit, the long first member having a predetermined

cross sectional shape, and having a constant radius of curvature and a constant angle carriage on the axial line in the longitudinal direction;

performing an axial bending process for the first member,
5 when the first member passes through a first member gripping portion, in which the first member is supplied continuously to the first member gripping portion of a bender disposed on the downstream side of the first member molding unit, and slidably gripped by the gripping portion, and the gripping
10 portion is disposed at a position in a direction crossing a supply direction of the first member;

causing the first member passing through the gripping portion to pass through an extrusion die provided near the gripping portion and at a position corresponding to an axial
15 position passing through the gripping portion; and

extruding a heated and molten liquid resin molding material for formation of a second member through an orifice of the extrusion die while following a bend of the first member to integrate the second member made of the molding material
20 and having a predetermined cross sectional shape with the first member.

18. The manufacturing method according to claim 17,
wherein the step of performing the axial bending process
25 includes performing a bending process for one part of the first

member passing through the gripping portion in the longitudinal direction at a different radius of curvature from the other part by changing the position of the gripping portion or the extrusion die in accordance with a length of the first member
5 passing through the gripping portion; and

the extruding step includes integrating the second member extruded through the orifice with the first member along a longitudinal direction of the processed first member.

10 19. The manufacturing method according to claim 17,
wherein the gripping portion performs at least two of the following operations,

(a) changing the position in a first direction crossing the direction of supplying the first member,

15 (b) changing the position in a second direction crossing at right angle to the first direction, and

(c) changing the angle carrier.

20 20. The manufacturing method according to claim 17, further comprising: detecting a supply length of the first member; and changing the position of the gripping portion or the extrusion die under a control in accordance with a predetermined program, when the supply length reaches a predetermined length.

- 25 21. The manufacturing method according to claim 17, further

comprising: compulsorily cooling and solidifying the second member after integrating the second member with the first member.

22. The manufacturing method according to claim 17,

5 wherein the step of forming a long first member includes:
roll forming a metallic strip material by the first member
molding unit, and forming continuously the first member having
the predetermined cross sectional shape in the longitudinal
direction.

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23. A method for manufacturing a long molding having an axial
twist along a longitudinal direction, comprising:

forming a long first member capable of plastic deformation
continuously in the longitudinal direction, by employing a first
15 member molding unit, the long first member having a predetermined
cross sectional shape, and having a constant radius of curvature
and a constant angle carriage on the axial line in the
longitudinal direction;

performing an axial twisting process for the first member,
20 when the first member passes through a first member gripping
portion, in which the first member is supplied continuously
to the first member gripping portion of a bender disposed on
the downstream side of the first member molding unit, and
slidably gripped by the gripping portion, and the gripping
25 portion is disposed at a carriage different from the constant

angle carriage;

causing the first member passing through the gripping portion to pass through an extrusion die provided near the gripping portion and at a carriage corresponding to an angle carriage of the first member passing through the gripping portion; and

extruding a heated and molten liquid resin molding material for formation of a second member through an orifice of the extrusion die while following a twist of the first member to integrate the second member made of the molding material and having a predetermined cross sectional shape with the first member.

24. An apparatus for manufacturing a long molding having at least one of an axial bend and an axial twist along a longitudinal direction, comprising:

a first member forming unit for forming a long first member capable of plastic deformation continuously in the longitudinal direction, the long first member having a predetermined cross sectional shape, and having a constant radius of curvature and a constant angle carriage on the axial line in the longitudinal direction;

a bender having a gripping portion, which is disposed on the downstream side of the first member forming unit, for slidably gripping the first member supplied continuously from

the first member forming unit, and a movement mechanism for moving at least one of an orientation and an angle carriage of the gripping portion so as to be different than the constant extrusion direction and the constant angle carriage; and

5 an extrusion die having an insertion hole into which the first member is inserted and an orifice through which a second member having a predetermined cross sectional shape is extruded from a liquid resin molding material for formation of the second member in heated and molten state, the extrusion die being
10 disposed near the gripping portion to cooperate with the arrangement of the gripping portion.

25. The manufacturing apparatus according to claim 17, further comprising: an extrusion machine; and

15 a flexible pipe having heating means;
 wherein the extrusion die is connected to the extrusion machine via the flexible pipe; and

 the resin molding material for formation of the second member extruded in heated and molten state from the extrusion
20 machine is supplied via the flexible pipe to the extrusion die.

26. A method for manufacturing a long molding having an axial bend along a longitudinal direction, comprising:

 forming a long first member capable of plastic deformation
25 continuously in the longitudinal direction, by employing a first

member forming unit, the long first member having a predetermined cross sectional shape, and having a constant radius of curvature and a constant angle carriage on the axial line in the longitudinal direction;

5 performing an axial bending process for the first member, when the first member passes through a gripping portion, in which the first member is supplied continuously to the gripping portion of a bender disposed on the downstream side of the first member forming unit, and slidably gripped by the gripping portion,
10 and the gripping portion is disposed at a position in a direction crossing a supply direction of the first member;

causing the first member passing through the gripping portion to pass through a second member extrusion die provided near the gripping portion and at a position corresponding to
15 an axial position of the first member passing through the gripping portion; and

extruding a heated and molten liquid resin molding material for formation of a second member through a second member molding opening of the second member extrusion die while
20 following a bend of the first member to integrate the second member made of the molding material with the first member;

wherein the second member extrusion die has a substantially changeable opening shape of the second member molding opening; and the second member having a different cross
25 sectional shape between one part and the other part in the

longitudinal direction is extruded in accordance with a change of the opening shape by changing the opening shape at a predetermined timing in extruding the second member.

5 27. The manufacturing method according to claim 26,
 wherein the opening shape of the second member molding
 opening is changed in accordance with the length of the first
 member passing through the gripping portion.

10 28. The manufacturing method according to claim 26, further
 comprising: detecting a supply length of the first member, and
 changing the position of the gripping portion or the extrusion
 die under a control in accordance with a predetermined program,
 when the supply length reaches a predetermined length.

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 29. The manufacturing method according to claim 26, further
 comprising: detecting the supply length of the first member;
 and changing the opening shape of the second member molding
 opening under the control in accordance with a predetermined
20 program, when the supply length reaches a predetermined length.

 30. The manufacturing method according to claim 26, further
 comprising: compulsorily cooling and solidifying the second
 member after integrating the second member with the first member.

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31. A method for manufacturing a long molding having an axial twist along a longitudinal direction, comprising:

forming a long first member capable of plastic deformation continuously in the longitudinal direction, by employing a first member forming unit, the long first member having a predetermined cross sectional shape, and having a constant radius of curvature and a constant angle carriage on the axial line in the longitudinal direction;

performing an axial twisting process for the first member, when the first member passes through a gripping portion, in which the first member is supplied continuously to the gripping portion of a bender disposed on the downstream side of the first member molding unit, and slidably gripped by the gripping portion, and the gripping portion is disposed at a carriage different from the constant angle carriage;

causing the first member passing through the gripping portion to pass through a second member extrusion die provided near the gripping portion and at a carriage corresponding to an angle carriage of the first member passing through the gripping portion; and

extruding a heated and molten liquid resin molding material for formation of a second member through a second member molding opening of the second member extrusion die while following a twist of the first member to integrate the second member made of the molding material with the first member;

wherein the second member extrusion die has a substantially changeable opening shape of the second member molding opening; and the second member having a different cross sectional shape between one part and the other part in the longitudinal direction is extruded in accordance with a change of the opening shape by changing the opening shape at a predetermined timing in extruding the second member.

32. An apparatus for manufacturing a long molding having at least one of an axial bend and an axial twist along a longitudinal direction, comprising:

a first member molding unit for forming a long first member capable of plastic deformation continuously in the longitudinal direction, the long first member having a predetermined cross sectional shape, and having a constant radius of curvature and a constant angle carriage on the axial line in the longitudinal direction;

a bender having a gripping portion, which is disposed on the downstream side of the first member molding unit, for slidably gripping the first member supplied continuously from the first member molding unit, and a movement mechanism for moving at least one of an orientation and an angle carriage of the gripping portion so as to be different than the constant extrusion direction and the constant angle carriage; and

a second member extrusion die having an insertion hole

into which the first member is inserted and a second member
molding opening through which a second member is extruded from
a liquid resin molding material for formation of the second
member in heated and molten state, the second member extrusion
5 die being disposed near the gripping portion to cooperate with
the arrangement of the gripping portion;

wherein the second member extrusion die is provided with
opening shape changing means for substantially changing opening
shape of the second member molding opening at a predetermined
10 timing.